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Material Management and Minimization Program

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U.S. DEPARTMENT OF
ENERGY



ARIES Oxide Production Program Dilute and Dispose LCCE Overview

Material Management and Minimization Program

Los Alamos National Laboratory / Pit Disassembly and Processing

Independent Validation Review

August 28 – 30, 2018

Unclassified Not UCNI

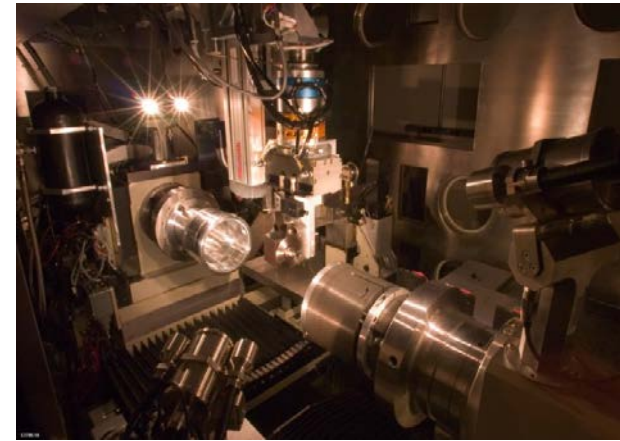
Reviewing Official: CR Richardson, R&D Engineer, SSE-DO

Date: 2018-08-30

- ARIES Oxide Production Program existing capacity
- Estimate Summary
- Lifecycle Estimate (LCCE) Scope – Pit Disassembly and Processing Operations and Projects
- LCCE Schedule
- LCCE Cost
- LCCE Risk
- Regulatory issues

Existing Capability: ARIES Oxide Production Program

- ARIES Oxide Production program started at LANL in 1998 in the PF-4 facility to demonstrate the feasibility of various pit disassembly and conversion processes.
- 1999-2007 - Conducted three demonstration phases in support of Pit Disassembly and Conversion Facility (PDCF) at SRS.
- 2008 - LANL assigned a 2 MT Pu oxide production mission to support the PMDA; oxide would be used to make MOX fuel.
- Current mission - Produce 2MT of Pu oxide from disassembly of pits from stockpile units identified as surplus by NA-23, certifying it for use in mixed-oxide (MOX) fuel production. 840 kg produced as of July 2018.
- Current production - Capability maintenance level of 100 kg/yr.
- 2016 – Congress authorized < \$5M for planning and conceptual design for a Dilute and Dispose option and to submit a report to Congress documenting program risks and a lifecycle cost estimate and schedule.



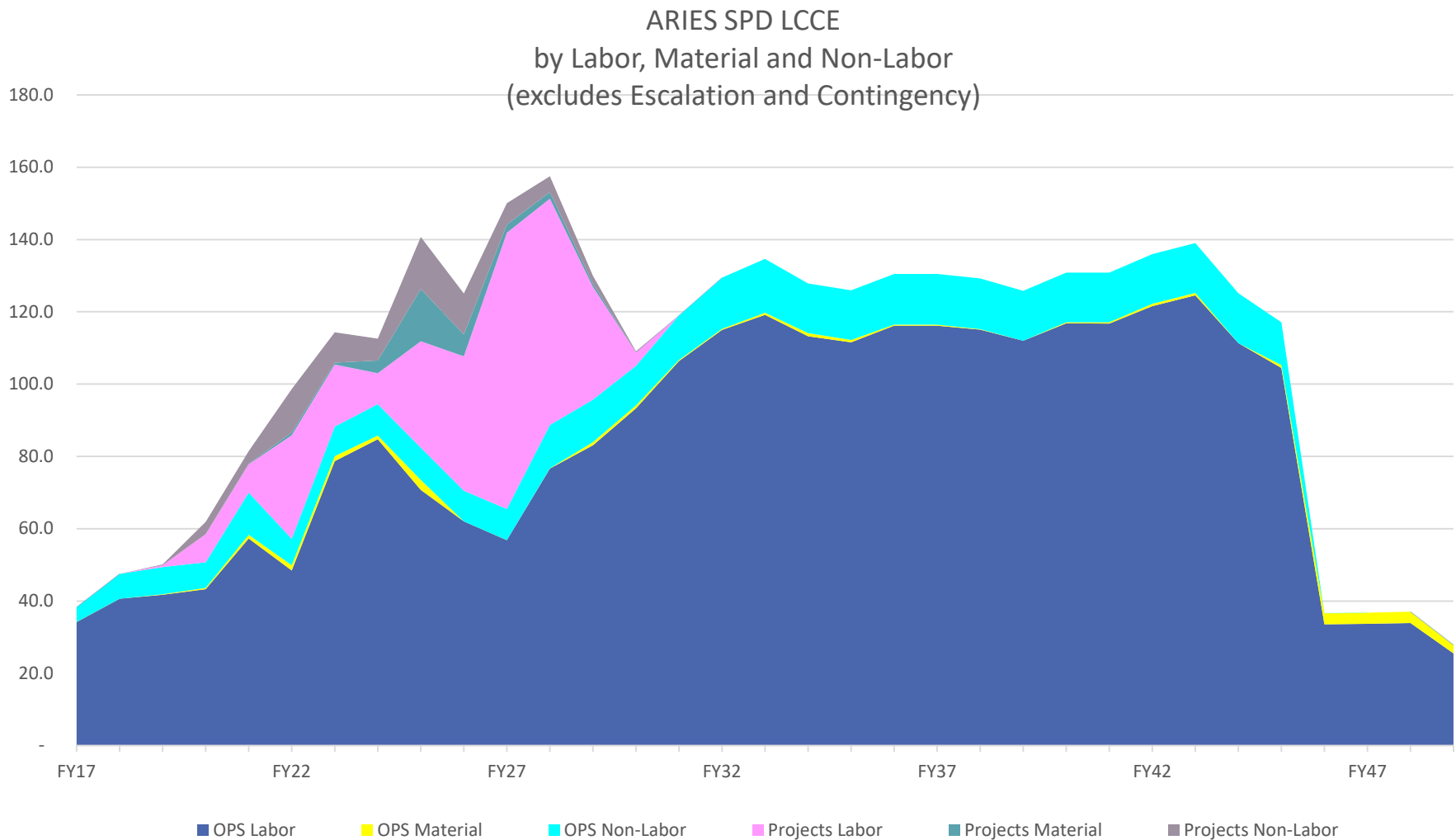
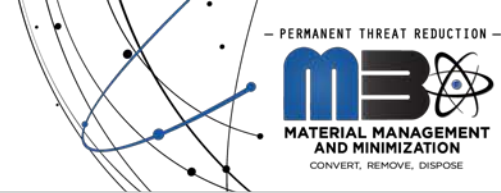
Robotic Lathe in PF-4

LANL Unescalated Cost Summary (without MR)

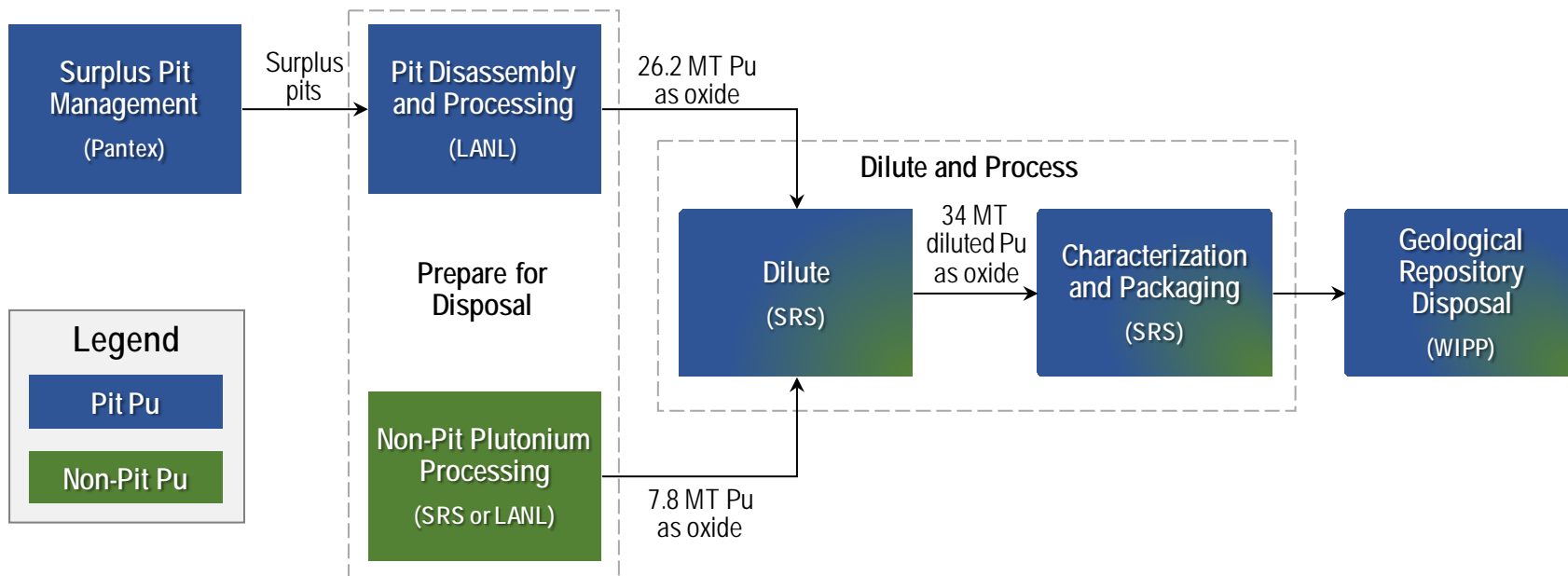


- Program Management – \$116M
- Operations – \$2,774M
- Equipment Projects (Line Item) – \$327M
- Facilities (Line Item) - \$87M
- Deactivation – \$183M
- Total Cost - \$3,487M (excludes DOE ODCs)
- MR is 100% for Line Item Projects

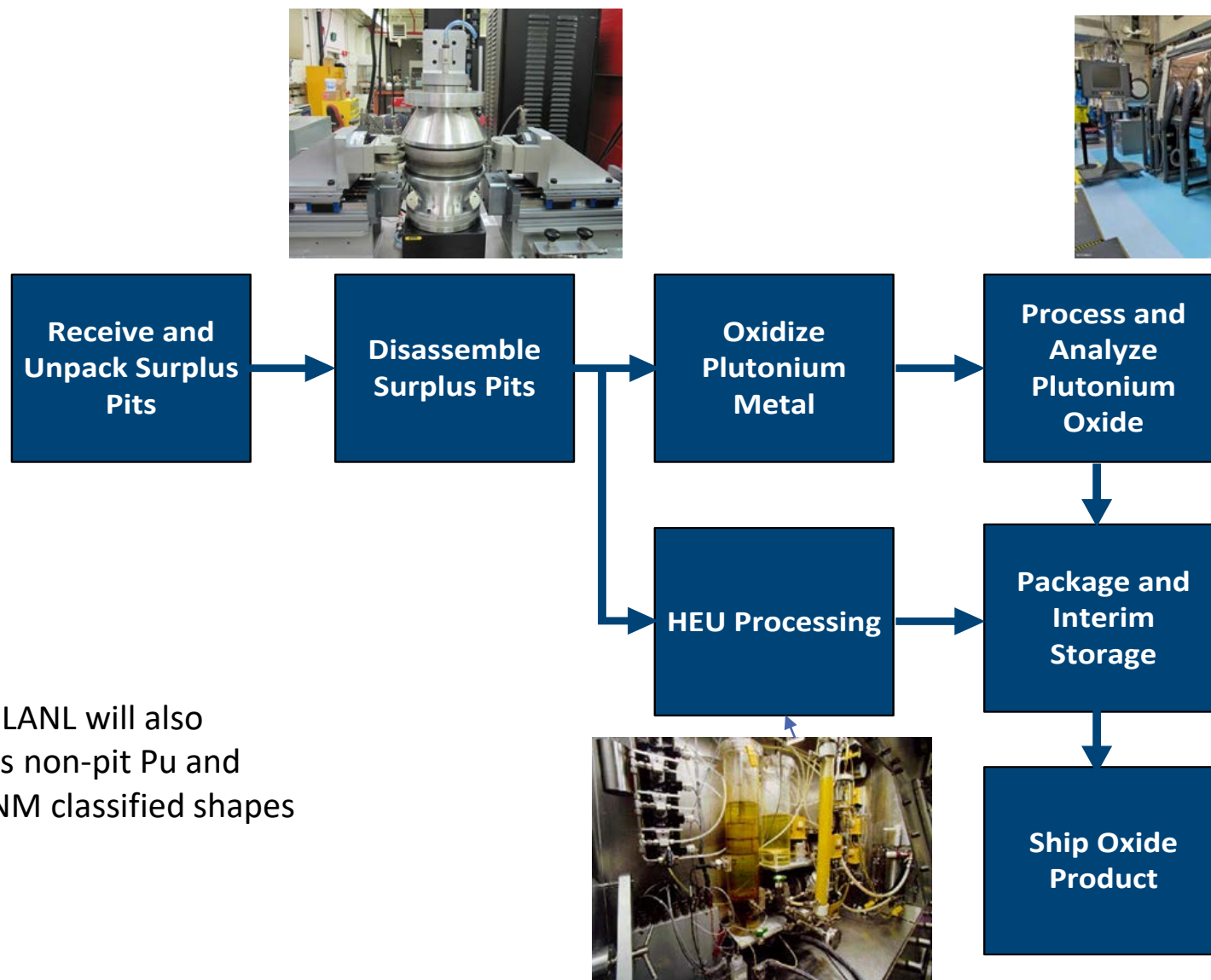
LANL Cost Graphic



Pit Disassembly and Processing at LANL within LCCE Scope

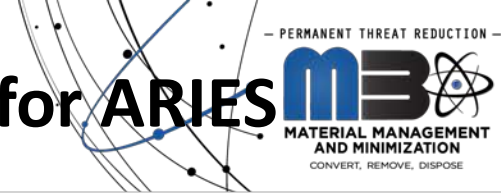


LANL Pit Disassembly and Processing Scope



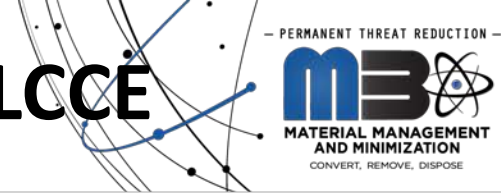
Note: LANL will also process non-pit Pu and non-SNM classified shapes

Selected LCCE Requirements/Assumptions for ARIES



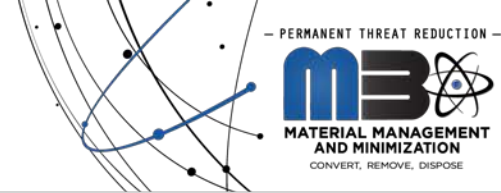
- Production Assumption – Increase LANL throughput to 400 Kg/year by FY25 with existing equipment and to 1500 Kg/year by FY33 with a new suite of equipment in one additional room;
- CD-0 for ARIES program to be submitted in FY19 (critical path within LANL schedule);
- All oxide produced at LANL will be shipped to SRS for dilution;
- Shipment of surplus Plutonium into South Carolina will begin only “after NEPA Record of Decision is issued” – estimated for 2020;
- Pu oxide feed specifications and packaging requirements are TBD in the PRD. LANL was directed to implement certain assumptions in the estimate, including changing from 3013 to SAVY or other packaging by 2023;
- Oxide production “will continue to meet the MOX feed specification and requirements through FY 2018;”
- Cost for incremental operation and infrastructure at LANL are based on agreements with DP for space in PF-4.

ARIES Operations Work Scope in the LCCÉ



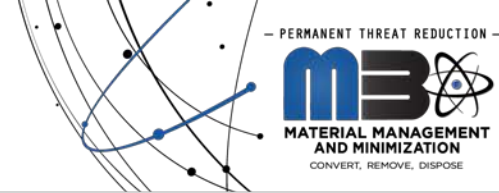
- Documented in SPD Operations Scope of Work Section 3.2
- LANL to perform the same work it currently performs using newer versions of existing equipment – just more of it
- LANL has previously demonstrated disassembly and conversion of all pit types in the surplus stockpile
- WBS is based on existing program WBS with minor modifications for expense-funded projects and long-term operational needs
- Expense-funded projects:
 - 9 Major Component Replacements over the lifecycle;
 - 8 MIE New Equipment Installation Projects (< \$10M each);
- One Technology Maturation Plan developed for concurrent HEU/Pu oxidation

Operations WBS Structure



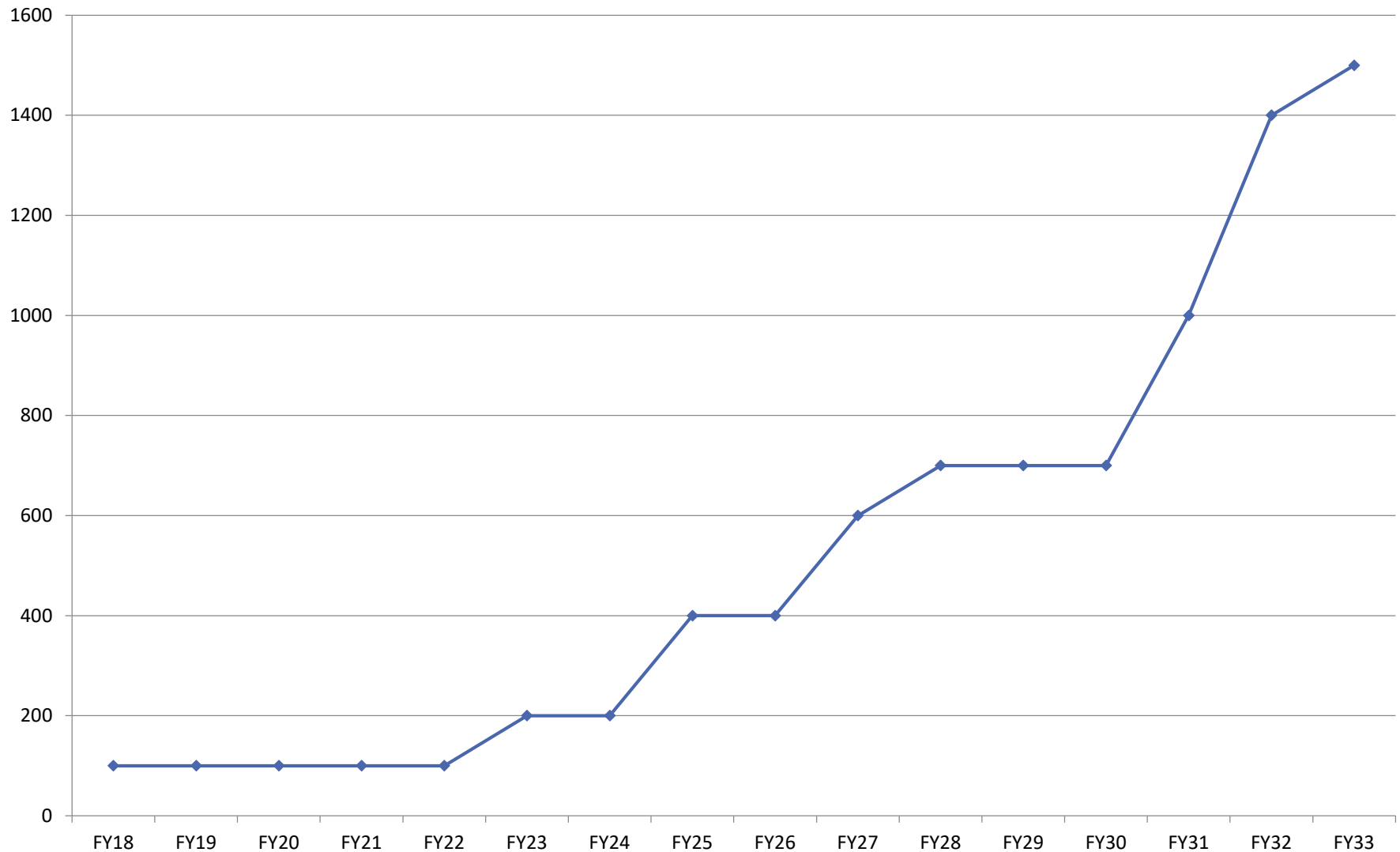
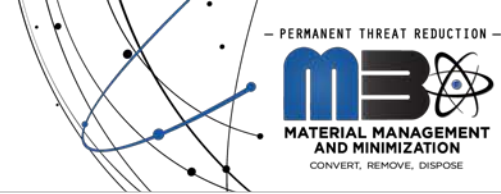
Level	WBS	Description
L5	23.03.02.02.02	Pit Disassembly and Processing
L6	23.03.02.02.02.01	Program Management
L6	23.03.02.02.02.02	Operations
L7*	23.03.02.02.02.02.01	Quality Assurance
L7*	23.03.02.02.02.02.02	Shipping/Receiving
L8	23.03.02.02.02.02.02.01	Shipping and Receiving (Labor)
L8	23.03.02.02.02.02.02.02	Purchase Shipping Containers
L7*	23.03.02.02.02.02.03	Disassembly
L7*	23.03.02.02.02.02.04	Operations Management
L8	23.03.02.02.02.02.04.01	Material Handling
L8	23.03.02.02.02.02.04.02	Engineering Support (AET)
L8	23.03.02.02.02.02.04.03	Production Planning and Control
L8	23.03.02.02.02.02.04.04	Records Management, Training, Document Control
L8	23.03.02.02.02.02.04.05	Equipment Maintenance
L8	23.03.02.02.02.02.04.06	Labor Ramp Up
L8	23.03.02.02.02.02.04.07	Operations Support
L7*	23.03.02.02.02.02.05	Produce Oxide
L7*	23.03.02.02.02.02.06	Oxide Milling/Blending
L7*	23.03.02.02.02.02.07	Uranium Processing
L7*	23.03.02.02.02.02.08	Packaging
L8	23.03.02.02.02.02.08.01	Pu Oxide Canning
L8	23.03.02.02.02.02.08.02	HEU Oxide Canning
L7*	23.03.02.02.02.02.09	Non-Destructive Assay
L7*	23.03.02.02.02.02.10	Analytical Chemistry
L7*	23.03.02.02.02.02.11	Pu Oxide Characterization
L7*	23.03.02.02.02.02.12	LANL Support
L8	23.03.02.02.02.02.12.01	Warehouse Procurement Storage
L8	23.03.02.02.02.02.12.02	Spare Parts and Consumables
L8	23.03.02.02.02.02.12.03	TRU Waste Disposal
L8	23.03.02.02.02.02.12.04	Disposal of Non-TRU Waste
L8	23.03.02.02.02.02.12.05	TA-55 Operations
L8	23.03.02.02.02.02.12.06	Nuclear Criticality Safety
	23.03.02.02.02.02.12.07	Legacy Inventory Risk Reduction

Operations WBS Structure, Cont'd

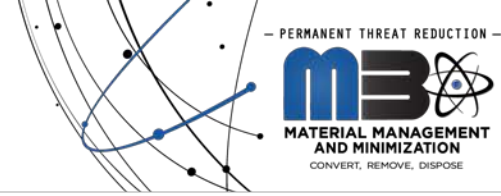


L7*	23.03.02.02.02.02.13	Recapitalization
L7*	23.03.02.02.02.02.14	Major Component Replacements
L8	23.03.02.02.02.02.14.01	Remove and Replace DMO #2
L8	23.03.02.02.02.02.14.02	Upgrade TGA System
L8	23.03.02.02.02.02.14.03	Upgrade Unloading/Loading Facilities
L8	23.03.02.02.02.02.14.04	New Storage and Transfer GB Refurbishments (4 total)
L8	23.03.02.02.02.02.14.05	Robotic Lathe Major Refurbishment
L8	23.03.02.02.02.02.14.06	Remove and Replace DMO #3
L8	23.03.02.02.02.02.14.07	Remove and Replace two (2) Muffle furnaces
L8	23.03.02.02.02.02.14.08	Refurbish U muffle furnace and glovebox
	23.03.02.02.02.02.14.09	Refurbish 1 GB for Bagouts (Main Room)
L7*	23.03.02.02.02.02.15	New Equipment MIEs/GPPs
L8	23.03.02.02.02.02.15.01	Calorimeter #2
L8	23.03.02.02.02.02.15.02	Stack Monitor Process Area
L8	23.03.02.02.02.02.15.03	Material Intro Hood #1
L8	23.03.02.02.02.02.15.04	Material Intro Hood #2
L8	23.03.02.02.02.02.15.05	Refurbish 1 U and one Pu GB with new Muffle Furnaces (in Packaging room)
L8	23.03.02.02.02.02.15.06	Refurbish GB for Transfers (in DMO-3 room)
L8	23.03.02.02.02.02.15.07	Simple Pit Cutter Installation
	23.03.02.02.02.02.15.08	New/Emerging Projects
L6	23.03.02.02.02.03	Deactivation at End of Operations
L7*	23.03.02.02.02.03.01	D&D
L7*	23.03.02.02.02.03.02	Design
L7*	23.03.02.02.02.03.03	PM

Throughput Requirements



LANL Project Work Scope in the LCCE

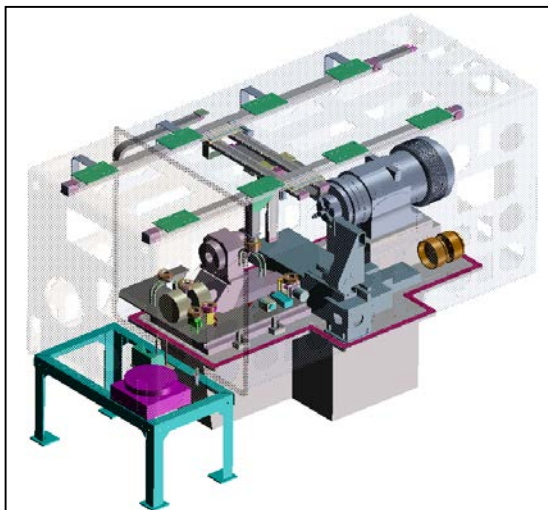


- Documented in “LANL Preconceptual Project Scope of Work for the Surplus Plutonium Disposition Dilute and Dispose Option, Rev. 1,” LA-CP-18-20396, June 2018.
- 15 equipment installation projects needed to meet production requirements based on the existing deterministic model of ARIES operations underpinned by detailed flow sheets
- Two new buildings also included in the estimate
- Installation projects will be performed under the existing PF-4 approved DSA. Preliminary evaluation is that none of the projects will require consideration as a Major Modification.

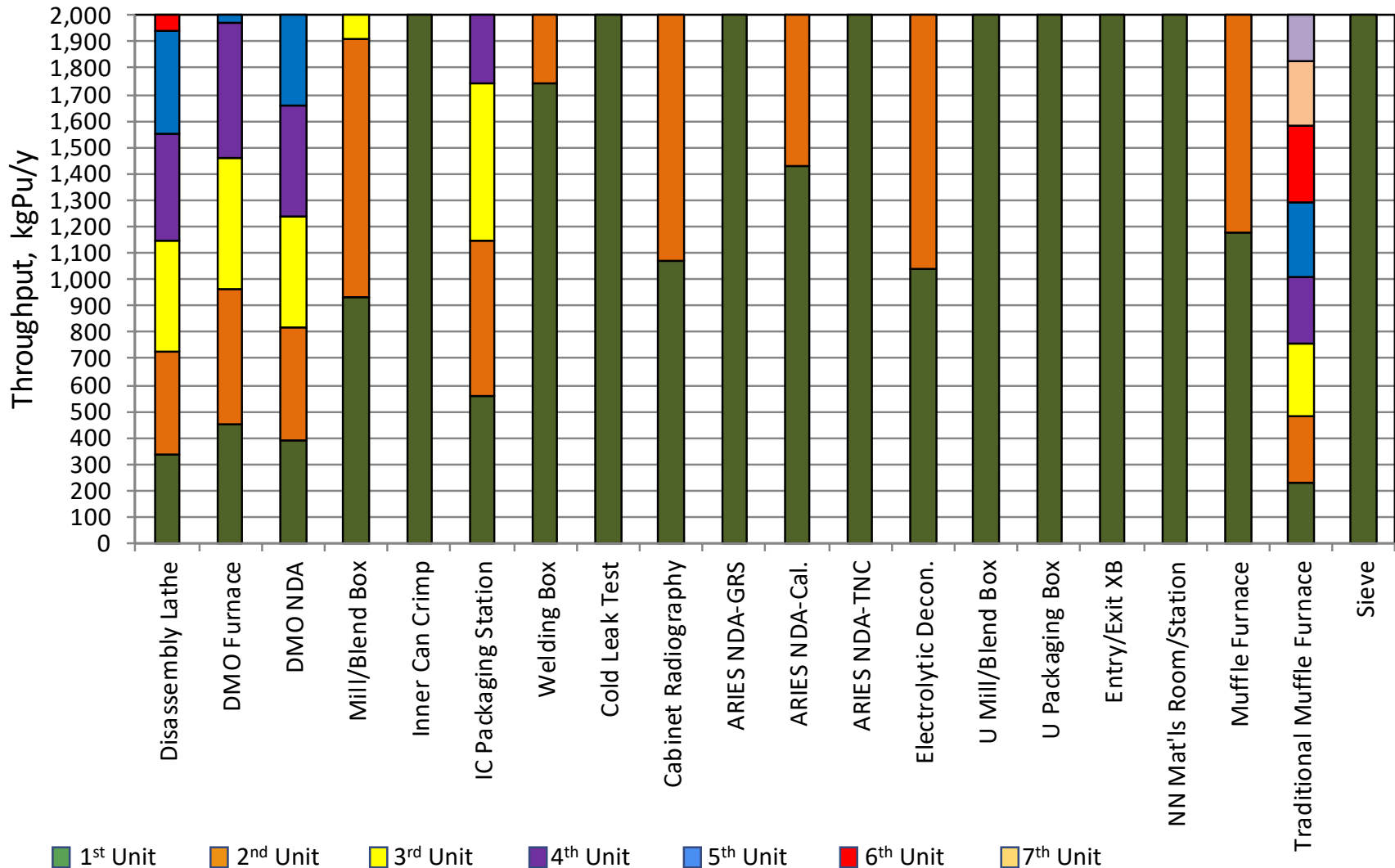
Projects Scope in the LCCE

Projects were conservatively estimated as two line item projects:

- First Line Item: 2 Support Facilities (Logistical Support Center; Construction Support Warehouse)
- Second Potential Line Item:
D&D of additional room and 15 New Process Equipment Installations;



Basis for Equipment Scope

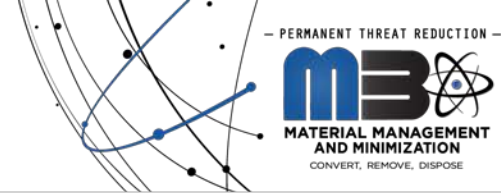


WBS Structure for Projects



L6	23.03.02.02.02.04	Projects
L7	23.03.02.02.02.04.01	Process Equipment Installation
L8	23.03.02.02.02.04.01.01	Comprehensive Pit Disassembly Lathe #2
L9*	23.03.02.02.02.04.01.01.01	Design
L9*	23.03.02.02.02.04.01.01.02	Fabrication/Installation
L9*	23.03.02.02.02.04.01.01.03	Transition to Operations
L9*	23.03.02.02.02.04.01.01.04	PM
L9*	23.03.02.02.02.04.01.01.05	Procurement (GFE)
L8	23.03.02.02.02.04.01.02	New Pu DMO #4
L8	23.03.02.02.02.04.01.03	Simple Pit Disassembly Lathe #2
L8	23.03.02.02.02.04.01.04	Install 2 new Muffle Furnaces in a New Glovebox
L8	23.03.02.02.02.04.01.05	New Can Crimper and Bagout GB
L8	23.03.02.02.02.04.01.06	Uranium Decontamination System #2
L8	23.03.02.02.02.04.01.07	Trunklines in New ARIES Room
L8	23.03.02.02.02.04.01.08	Install 4 Material Entry Hoods
L8	23.03.02.02.02.04.01.09	Inline Storage Glovebox #1
L8	23.03.02.02.02.04.01.10	U Precip/Staging Glovebox
L8	23.03.02.02.02.04.01.11	Comprehensive Pit Disassembly Lathe #3
L8	23.03.02.02.02.04.01.12	New Pu DMO #5
L8	23.03.02.02.02.04.01.13	Inline Storage Glovebox #2 (Main Room)
L8	23.03.02.02.02.04.01.14	New Blending Glovebox #2 (New Room)
L8	23.03.02.02.02.04.01.15	Transfer Glovebox for DMO-5
L8	23.03.02.02.02.04.01.16	D&D of Room for New Installations
L9*	23.03.02.02.02.04.01.16.01	D&D (Room #xxx)
L9*	23.03.02.02.02.04.01.16.02	PM
L9*	23.03.02.02.02.04.01.16.03	Demolition and Removal (Room #xxx)
L7	23.03.02.02.02.04.02	Process Support
L8*	23.03.02.02.02.04.02.01	Operations Warehouse/Mock-Up Facility/Machine Shop
L8*	23.03.02.02.02.04.02.02	Logistical Support Center

Schedule Development



- The overall schedule was developed to meet the overall throughput levels to achieve completion of LANL Dilute and Dispose operations by 2045.
- Major component replacement projects within the Operations WBS are scheduled in the years in which the replacements are expected to be required based on historical process performance under ARIES program activities.
- The project schedule conservatively assumes equipment installations will be grouped into a line item project. Each major glovebox/process would be a standalone sub-project so that the individual capabilities can be tracked to the program need.
- Schedule plans for three years of fabrication and installation, based on construction timelines for other similar Line Item projects

Schedule Summary

LCCE LANL Level 1 Schedule

Surplus Pit Management



Pantex Plant

Prepare for Disposal



Los Alamos National Lab

Dilute and Process

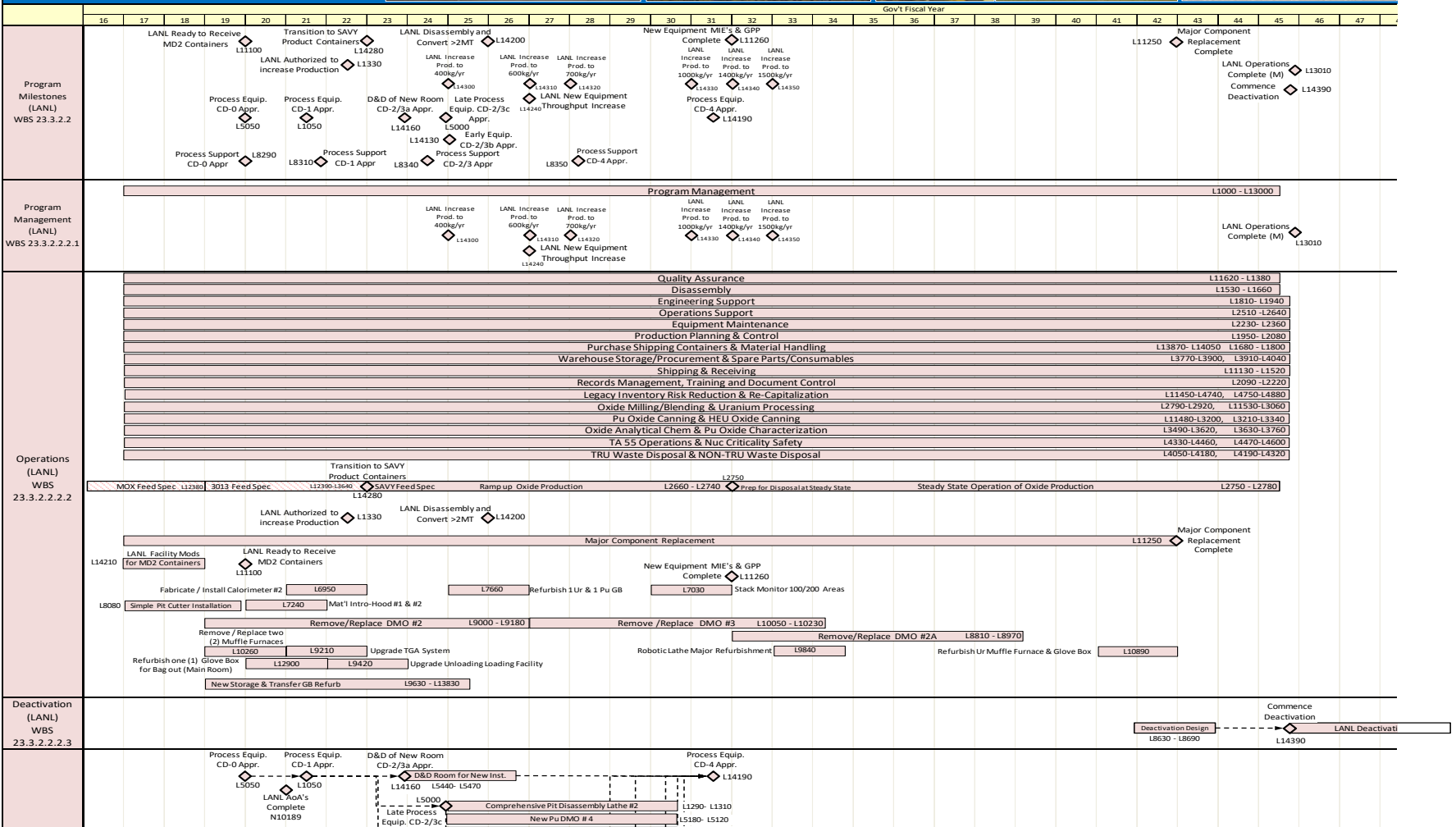


Savannah River Site

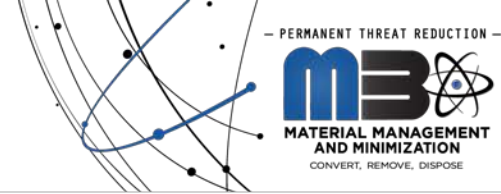
Geological Repository Disposal



Waste Isolation Pilot Plant

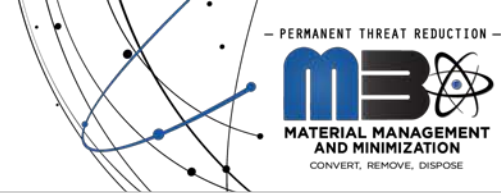


Project Schedule Milestones



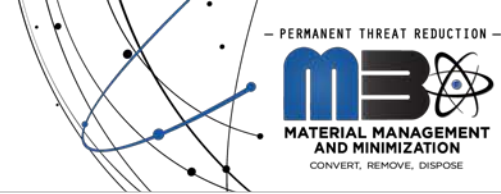
- CD-0 approval for projects is needed by Sept. 2019 with development and submittal of a CD-1 package by March 2021.
- After CD-1 approval, the equipment installations would be split into three phases based on need-by dates and space availability:
 - Phase 1 (CD-2/3a): D&D of new room
 - Phase 2 (CD-2/3b): Installations outside of the new room – New Can Crimper and Bagout glovebox, Comprehensive Pit Disassembly Lathe #3, New Pu DMO #5, Inline Storage Glovebox (Main Room), Transfer glovebox for DMO-5, and Trunklines in the new room
 - Phase 3 (CD-2/3c): Later equipment installations inside of the new room after D&D.
- Schedule for the remaining major tasks would be as follows:
 - Approval of CD-2/3a package for New Room D&D – August 2023
 - Approval of CD-2/3b for early equipment projects – September 2024
 - Approval of CD-2/3c for later equipment – November 2024
 - Federal Approval of CD-2/3 package for Support Facilities – May 2024
 - Completion of new room D&D – June 2026
 - Equipment Installations complete (through transition to operations) – June 2030

Major LCCE Schedule Elements



- Approval of CD-0 “Mission Need Revalidation” package by DOE (L5020) – September 2019
- Receive CD-1 approval (including conducting an AoA) (L1050)– April 2021
- Building construction (L8400) begins May 2024
- Room D&D construction (L5440) begins August 2023
- Achieve 700 kg installed equipment capacity (L14240) – September 2026
- Achieve 1500 kg installed capacity (L14270) – August 2030
- Construction of Process Support Facilities (L8530) complete – Nov. 2026
- Increase production to 1500 kg/yr (L14350) – October 2032
- Operations Complete (L13010) – August 2045

Cost Estimating Approach



- Different approaches used for Operations and Projects WBS elements
- Scope and Quantity Development Packages (LANL BOE forms) were developed for all Level 8 Operations and Level 9 Project WBS elements
- Operations estimate based on existing operations and previous maximum production year; scaling factor used for labor
- Parametric estimates for major projects
 - Based on costs from recent line item projects for similar work (CMRR gloveboxes)
 - Recent equipment purchases and PF-4 installations
 - Productivity factors for projects and Operations based on historical performance

FY17 thru FY23 Operations Estimate

- Operations estimate for initial years based on the FY17 approved budget for the ARIES program and the FY19-FY23 FYNSP.
 - Labor rates = fully burdened, representative FY17 rates. Estimated by calculating the average rate for each resource category performing similar work activities.
- Operations estimate for later years (FY24-45) based upon the development of a Reference Year budget.
- Calculations are documented on SQDPs.

Operations Reference Year Estimate

- Variable cost portion of the Reference Year cost based on a bottoms-up estimate of the resources required to create a single Blend Lot (BL) of oxide. This BL estimate was based upon the estimates prepared for 2013 Steady State Feedstock (SSFP) estimate and current resource utilization.
- Multiplied BL estimates by the expected number of Lots (38) to achieve the required amount of material for the Reference Year.
- Labor hours for supervision were estimated as a ratio of the number of personnel within each group (used about a 10:1 employee to supervisory ratio).
- Technical support cost was independently estimated based on the complexity of each process equipment system.

Operations Reference Year Estimate

Example of Reference Year resources shown below:

Pu PACKAGING REFERENCE YEAR RESOURCES				
RESOURCE NAME	Units	Unit Cost	Lot Cost	Annual Cost
Resources per Blend Lot				
TECHNICIAN	256	148	37,888	1,439,744
Annual Process Expenses				
MANAGER	1,434	261		374,274
SCIENCE AND ENGINEERING	4,838	278		1,344,964
PROFESSIONAL	0	227		0
TECHNICIAN	692	148		102,416
Non-Labor Expenses at 15% of Labor				489,210
Purchase Product Cans				639,586
Reference Year TOTAL	16,692			4,390,194

Operations FY24 thru FY45 Estimate

Developed the estimate for FY24-45 by extrapolating the annual cost for each year in the production period based on the ratio of the required production for that year to the production value of the Reference Year (e.g., 1500 kg/475kg = . We adjusted this value to account for economy of scale using a scaling factor (SF). The scaling factor was determined by applying the equation shown below:

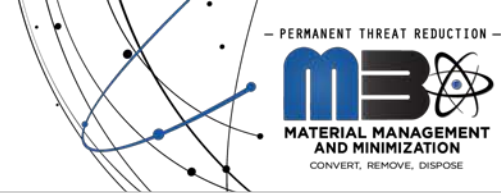
$$SF = (Period\ Production\ Rate / Base\ Year\ Rate)^{TE}$$

where TE = Throughput Exponent.

Extrapolation using TE

- TE is determined by evaluating the linearity of the WBS element cost to changes in the process throughput.
- Linearity varies from 1.0 for those WBS elements which are highly linear to 0.4 for those that are loosely correlated to throughput ratio.
- Example - TE for Pu Oxide Canning is assumed 1.0 or Linear.
- Preliminary estimate compared to current year operations and FY19-FY23 FYNSP. If it appeared that the extrapolated estimate underestimated the anticipated costs, the estimate was increased to that projected by the FYNSP and the transition between the two estimating approaches was moderated.
- Exceptions - facility utilization recharge, Non-SNM waste disposal, and TRU waste disposal, which were estimated using a bottoms-up method for each of the operating years.

FTEs in Operations Estimate

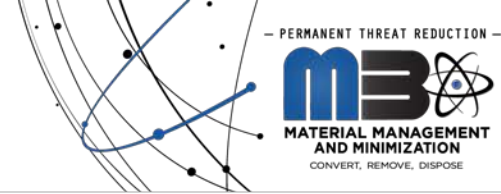


Operations will require more than 3x current staffing levels.

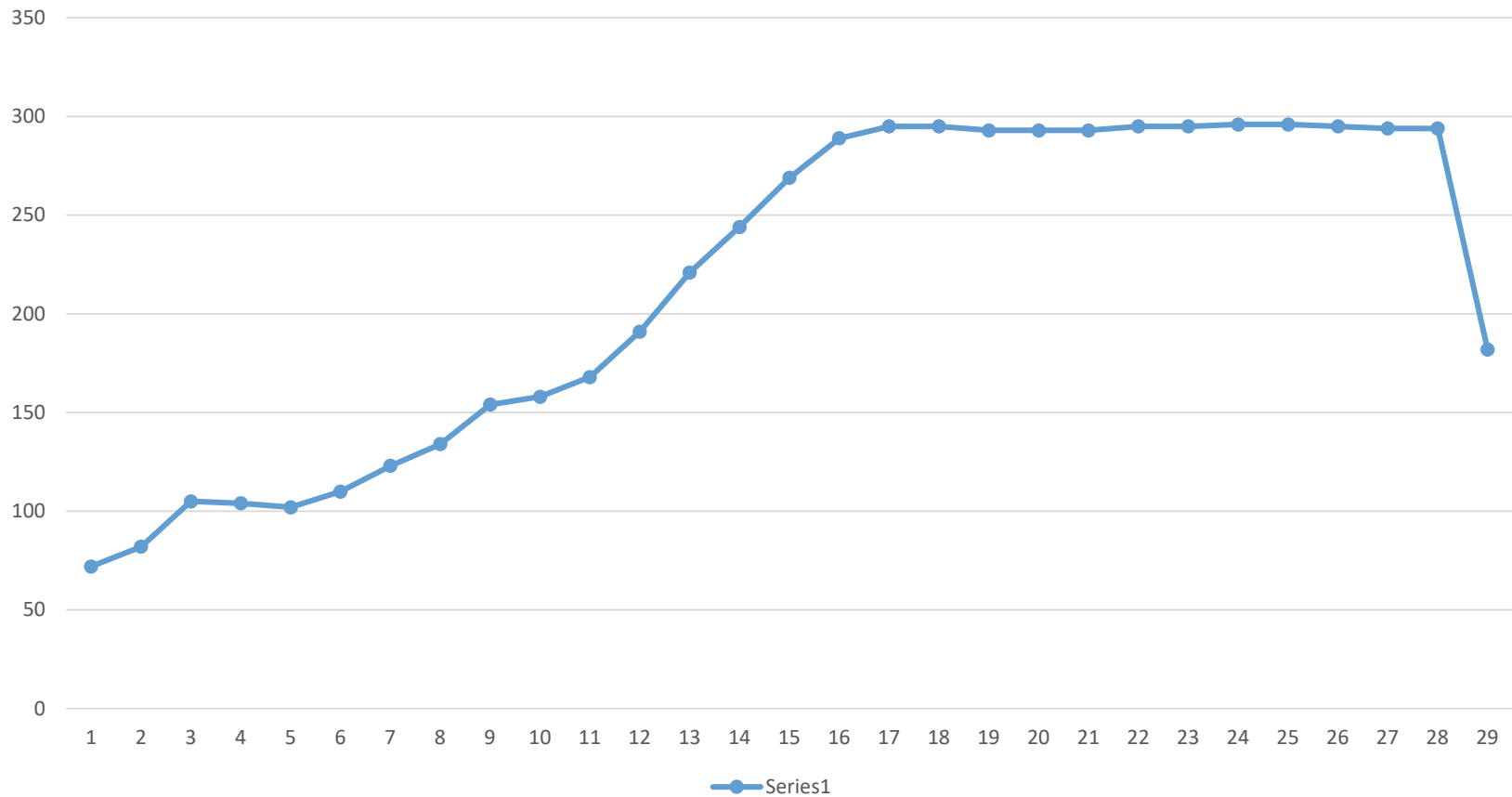
FY	Program Totals*
2018	82
2019	105
2020	104
2021	102
2022	110
2023	123
2024	134
2025	154
2026	158
2027	168
2028	191
2029	221
2030	244
2031	269
2032	289
2033	295
2034	295
2035	293
2036	293
2037	293
2038	295
2039	295
2040	296
2041	296
2042	295
2043	294
2044	294
2045	182

*Totals exclude project personnel

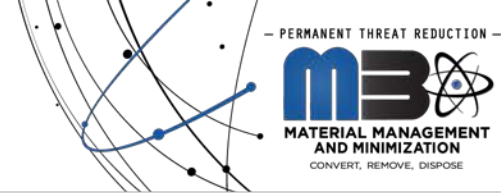
View of Operations FTEs



Staffing Requirements

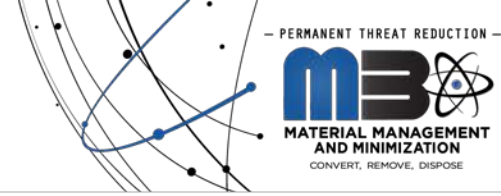


Operations Cost Assumptions



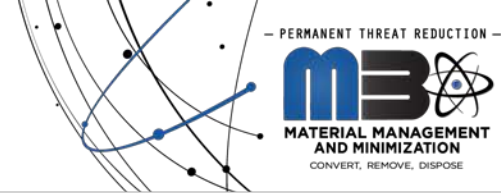
- LANL facilities will remain available to support pit disassembly, conversion, and storage through FY45;
- Office of Secure Transportation (OST) shipping costs are excluded;
- Pu oxide feed specifications requirements that were TBD in the Program Requirements Document are not yet final, but the program is assumed to transition from 3013 to SAVY packaging by FY23;
- All oxide produced by ARIES will go to SRS for dilution prior to WIPP disposal and shipment of surplus Pu to SRS will begin no later than FY23;
- Cost for incremental operation and infrastructure at LANL are assumed to follow the current PF-4 space tax model;
- Assumes a single shift with selective overtime to maximize operational efficiency, as is the current mode of operations;
- Operating costs to use the MD-2 container will be equivalent to the current costs with the FL container;
- Replacement rates are furnaces every 10 years, lathes every 15 years, and control systems every five years (the latter in the Recapitalization WBS);
- Assumes the MC&A inventory frequency in PF-4 is every eight weeks.

Project Cost Assumptions



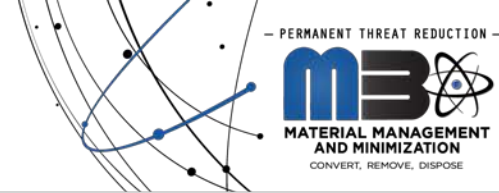
- Project costs are based on parametric estimates;
 - ❖ Based on costs from recent line item projects for similar work (e.g., CMRR gloveboxes)
 - ❖ Recent equipment purchases and PF-4 installations
 - ❖ Productivity factors for projects based on historical performance
- Project funding and authorizations will be provided in a timely manner per the program funding profile;
- The Transition to Operations (TtO) scope includes completion of equipment testing and readiness assessments;
- New Process Support facility projects cost based on assumed Design/Build strategy;
- Opportunities for cost-sharing with other line item projects at LANL are captured in risk space.

Risks and Opportunities



- Summary of Risks and Opportunities by Type
 - Program – 5 Risks and 3 Opportunities were identified.
 - Risks of LANL not meeting the production schedule > 6 months, i.e., container not available, Major Item of Equipment (MIE)/Line Item Project (LIP) equipment installation delays impact production.
 - Opportunities to enhance LANL's capabilities to meet the production schedule i.e., flexible production schedule to maximize production, use installations from other LIPs, installation of additional capacity at LANL.
 - Execution – 5 Risks and 1 Opportunity were identified
 - Risks of LANL not meeting the production schedule < 6months, i.e., staff availability, in-line storage, MIE/LIP installation delayed.
 - Opportunity of reducing bottleneck by adding an in-line NDA sampling station.
 - Risk of insufficient storage at LANL will be avoided with the addition of in-line storage in the schedule.
 - Project – 28 Risks were identified
 - Capital Project Line Item risks were identified from lessons learned on other projects and current construction at TA-55 (CMRR).

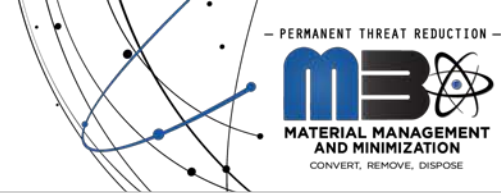
Major Identified Risks and Opportunities



Dollars in Thousands Time in Days

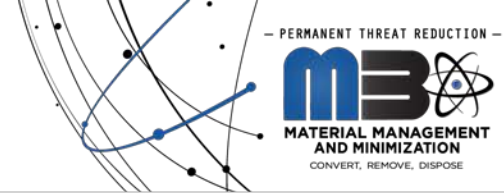
Dollars in Thousands Time in Days				UNMITIGATED			RESIDUAL							
Risk ID	Risk Name	Type	Risk/Opp Classification	Unmitigated Risk Level	Unmit Prob	Handling Strategy	Residual Risk Level	Resid Prob	Best Case Cost	Most Likely Cost	Worst Case Cost	Best Case Sch	Most Likely Sch	Worst Case Sch
E-LANL3178	(Execution, LANL) Insufficient Storage Locations at LANL Impacts Productivity	Risk	Execution	High: 23	50 %	Avoidance	NIL: 0	0 %	\$0	\$ 0	\$ 0	0.0	0.0	0.0
E-LANL3179	(Execution, LANL) Material-At-Risk (MAR) Limits at LANL May Restrict Simultaneous Movement of Items	Risk	Execution	Low: 6	10 %	Acceptance	Low: 6	10 %	\$150	\$ 600	\$ 1,500	0.5	1.0	2.0
E-LANL3180	(Execution, LANL) Insufficient Availability of Shipping Containers at LANL Delays Shipments	Risk	Execution	Low: 7	20 %	Mitigation	Low: 6	10 %	\$0	\$ 0	\$ 0	0.5	1.0	12.0
E-LANL3181	(Execution, LANL) Limited Staffing At LANL Affects Production and Causes Delays	Risk	Execution	Moderate: 17	70 %	Mitigation	Low: 6	10 %	\$0	\$ 600	\$ 800	0.0	0.5	5.0
E-LANL3182	(Execution, LANL) Equipment Breakdown Impacts Operations	Risk	Execution	Moderate: 9	50 %	Mitigation	Low: 7	20 %	\$250	\$ 750	\$ 2,500	0.3	0.5	1.0
E-LANL3186	(Execution, LANL) Small In-Line Sample Analysis Improves Movements	Opportunity	Execution	NIL: 0	0 %	Exploit	Moderate Opportunity: - 18	5 %	\$0	(\$ 160,000)	(\$ 160,000)	0.0	0.0	0.0
PG-LANL2700	(Program, LANL) Anomalous Events Occur At LANL Causing Processing Delays That Impact SRS And Pantex	Risk	Program - SPD NNSA	High: 24	84 %	Transference	High: 24	84 %	\$0	\$ 0	\$ 0	6.0	12.3	24.0
PG-LANL2743	(Program, LANL) Dilute and Dispose Approach Cannot Use SAVY Containers Impacting Program Cost And Schedule	Risk	Program - SPD NNSA	High: 22	15 %	Mitigation	Moderate: 18	5 %	\$0	\$ 68,700	\$ 0	0.0	61.0	0.0
PG-LANL3187	(Program, LANL) Maximizing Production Prior/During Facility Modifications Provides Flexibility In Production Schedule	Opportunity	Program - SPD NNSA	NIL: 0	0 %	Exploit	Minor Opportunity: - 6	10 %	\$0	\$ 0	\$ 0	0.3	3.0	5.0
PG-LANL3188	(Program, LANL) Lower Than Expected Oxide Production Rate at LANL Requires Extended Operation	Risk	Program - SPD NNSA	High: 22	30 %	Transference	Moderate: 16	30 %	\$0	\$ 234,000	\$ 234,000	0.0	0.0	17.0
PG-LANL3189	(Program, LANL) Recover Production Schedule by Installing Additional Capacity at LANL	Opportunity	Program - SPD NNSA	NIL: 0	0 %	Exploit	Significant Opportun: -23	67 %	\$0	\$ 0	\$ 0	0.0	19.2	38.4
PG-LANL3501	(Program, LANL) LANL Equipment Installation Schedule Delays Impact Operations Ramp-up	Risk	Program - SPD NNSA	High: 23	52 %	Mitigation	High: 23	52 %	\$2,099	\$ 4,106	\$ 7,230	16.0	26.0	35.0
PG-LANL3502	(Program, LANL) Utilization of Installations from Other Line Item or Programmatic Projects at LANL	Opportunity	Program - SPD NNSA	NIL: 0	0 %	Share	Moderate Opportunity: - 9	40 %	(\$16,500)	(\$ 36,500)	(\$ 82,500)	0.0	3.0	6.0
PG-LANL5238	(Program, LANL) Line Item Projects Are Not Completed In Time For Ramp-Up	Risk	Program - SPD NNSA	Moderate: 13	70 %	Mitigation	Moderate: 13	60 %	\$0	\$ 500	\$ 10,000	0.0	3.0	39.2

Regulatory Issues



No major issue identified.

Backup Information



Example of Operations SQDP



Services Scoping and Quantity Development Package (SQDP) Cover Sheet Rev 1

(to be used as Estimating Scope Transmittal)

1. SQDP Number		17-00196-SPD-PuCanning		2. Rev. Number		B	
3. Prep. Date		1/19/2018		4. Estimate Number		17-00196	
5. Subject Matter Expert (SME)		Charles Richardson		6. SME Phone Number		007-5508	
7. SME Org.		SSE-2		8. SQDP Content Title		Pu Oxide Canning	
9. WBS Number		23.03.02.02.02.08.01		10. Confidence Levels		10a. Quantity, Productivity, Labor Confidence Level: Medium 10b. Material Confidence Level: Medium 10c. Sub Confidence Level: Medium 10d. Equipment Confidence Level: Medium 10e. Escalation Confidence Level: Medium	
11. Management		1		2		3	
12a. Quality Level		Commercial		Nuclear		HAZMAT	
12b. Other Uncertainty Class Description				13. Funding Type (Prepare separate forms for each type)		Construction	
13. Expense				Expense			

14. Work Package Summary Description (Attach Backup Documents for Jobhours and ODC Development)
 The work performed under this WBS element is associated with packaging plutonium oxide into containers for storage and shipment from LANL. Until FY24, Plutonium oxide will be packaged into 3013 container sets that include a convenience can, an inner can, and an outer can. The convenience can is crimped and the inner and outer cans are welded. The inner canning process includes welding the inner can and decontaminating the can so that the outer surface of the inner can is free of contamination and can be released into the process rooms. The operational outer-can welding system is a commercial off-the-shelf welder. As per Change Form 001, the program will transfer to use of SAVY containers in lieu of 3013 containers starting in 2023. SAVY containers do not require welding. This WBS also includes the procurement of the convenience cans, an inner can, and outer cans.

Schedule: This WBS extends from FY17 thru the end of the program currently estimated to be in FY45.

Task/Description (Activity ID)	Deliverable Description (Activity Description)	Deliverable Qty	Annual Labor \$	Annual MSS \$	Est \$
		TBD	NA	NA	223,648,350
L11480	FY17 Pu Oxide Canning	1	2,386,800	265,200	\$2,652,000
L12180	FY18 Pu Oxide Canning	1	2,386,800	265,200	\$2,652,000
L12190	FY19 Pu Oxide Canning	1	2,386,800	265,200	\$2,652,000
L12200	FY20 Pu Oxide Canning	1	2,386,800	265,200	\$2,652,000
L12210	FY21 Pu Oxide Canning	1	2,386,800	265,200	\$2,652,000
L12220	FY22 Pu Oxide Canning	1	2,386,800	265,200	\$2,652,000
L3080	FY23 Pu Oxide Canning	1	1,873,560	740,800	\$2,614,375
L3090	FY24 Pu Oxide Canning	1	1,873,560	740,800	\$2,614,375
L3100	FY25 Pu Oxide Canning	1	2,498,062	962,168	\$3,460,260
L3110	FY26 Pu Oxide Canning	1	2,498,062	962,168	\$3,460,260
L3120	FY27 Pu Oxide Canning	1	3,747,138	1,372,328	\$5,119,467
L3130	FY28 Pu Oxide Canning	1	4,371,661	1,552,442	\$5,924,104
L3140	FY29 Pu Oxide Canning	1	4,371,661	1,552,442	\$5,924,104
L3150	FY30 Pu Oxide Canning	1	4,371,661	1,552,442	\$5,924,104
L3160	FY31 Pu Oxide Canning	1	6,245,230	2,095,081	\$8,310,311
L3170	FY32 Pu Oxide Canning	1	8,743,322	2,702,959	\$11,446,281
L3180	FY33 Pu Oxide Canning	1	9,367,945	2,856,341	\$12,224,186
L3190	FY34 thru FY44 Pu Oxide Canning	11	9,367,945	2,856,341	\$134,466,050
L3200	FY45 Pu Oxide Canning	1	4,577,754	1,610,721	\$6,188,474

15. Basis and Assumptions: The estimate is based upon two sources. The first is for the years FY17 thru FY22. This portion of the estimate is based upon the FY17 approved budget for the ARES program and the FY19-FY23 FYNRP. The second portion of the estimate is based upon the development of a Reference Year budget. We developed the Reference Year cost estimate for this WBS from a bottoms-up estimate of the resources required to package a single Blend Lot of oxide into product cans. The basis for this estimate was prior operations using 3013 can sets. The Reference Year estimate was adjusted to accommodate the anticipated use of SAVY containers by reducing the Labor estimate by 10%. The cost differential between the SAVY can set and the 3013 can set was not judged to be significant and no adjustment was made. We then multiplied these values by the expected number of Lots to achieve the required amount of material for the Reference Year. We then extrapolated the annual cost for each year in the production period based upon the ratio of the required production for that year to the production value of the reference year. We adjusted this value to account for economy of scale using a scaling factor. We also adjusted the estimates for the transition period from the FYNRP estimate to the estimate based upon the Reference Year. Resources requirements are based upon the SSFP resource requirements as modified by recent experience. Labor rates are fully burdened representative FY17 rates.

Pu PACKAGING REFERENCE YEAR RESOURCES				
RESOURCE NAME	Units	Unit Cost	Lot Cost	Annual Cost
Resources per Blend Lot				
TECHNICIAN	256	148	37,888	1,439,744
Annual Process Expenses				
MANAGER	1,434	261		374,274
SCIENCE AND ENGINEERING	4,838	278		1,344,964
PROFESSIONAL	0	227		
TECHNICIAN	692	148		102,416
Subtotal Labor				3,261,398
Non-Labor Expenses at 15% of Labor				489,210
Purchase Product Cans				639,586
Reference Year TOTAL	16,692			4,390,194

Assumptions:
 16. Attached Documents List:
 17. Unresolved Issues:
 18. Management Reserve Estimate Uncertainty Confidence Basis:
 Concurrence/Approvals (once Scoping review have been completed)


SME	Charles Richardson		
Cost Scheduler	Mark Randall Davidsmeyer		
Div/Project Manager	Julia Whitworth		
Estimator	Jeff Kelley		
	Printed Name	Signature	Date

Example of Operations SQDP Basis Detail

17-00196-SPD-PuCanning						23.03.02.02.02.02.08							
Production Target	Production Ratio	SF Labor	SF Non Labor	Labor Pricing basis	Non-Labor Pricing	Packaging		Labor \$	Technicians	Science and Engineering	Professionals	Managers	Total
100	NA	NA	NA	FY19-FY23 FYNP	FY19-FY23 FYNP	2,652,000	2017	2,388,800	5.8	1.4	0.0	0.5	7.7
100	NA	NA	NA	FY19-FY23 FYNP	FY19-FY23 FYNP	2,652,000	2018	2,388,800	5.8	1.4	0.0	0.5	7.7
100	NA	NA	NA	FY19-FY23 FYNP	FY19-FY23 FYNP	2,652,000	2019	2,388,800	5.8	1.4	0.0	0.5	7.7
100	NA	NA	NA	FY19-FY23 FYNP	FY19-FY23 FYNP	2,652,000	2020	2,388,800	5.8	1.4	0.0	0.5	7.7
100	NA	NA	NA	FY19-FY23 FYNP	FY19-FY23 FYNP	2,652,000	2021	2,388,800	5.8	1.4	0.0	0.5	7.7
100	NA	NA	NA	FY19-FY23 FYNP	FY19-FY23 FYNP	2,652,000	2022	2,388,800	5.8	1.4	0.0	0.5	7.7
200	0.425531915	0.42553	0.50483	1,873,569	740,806	2,614,375	2023	2,352,938	5.7	1.4	0.0	0.4	7.6
200	0.425531915	0.42553	0.50483	1,873,569	740,806	2,614,375	2024	2,352,938	5.7	1.4	0.0	0.4	7.6
400	0.85106383	0.85106	0.87898	2,498,092	992,168	3,490,260	2025	3,141,234	7.6	1.9	0.0	0.6	10.1
400	0.85106383	0.85106	0.87898	2,498,092	992,168	3,490,260	2026	3,141,234	7.6	1.9	0.0	0.6	10.1
600	1.276595745	1.2766	1.21575	3,747,138	1,372,328	5,119,467	2027	4,607,520	11.2	2.8	0.0	0.9	14.8
700	1.489361702	1.48936	1.37531	4,371,681	1,552,442	5,924,104	2028	5,331,693	13.0	3.2	0.0	1.0	17.2
700	1.489361702	1.48936	1.37531	4,371,681	1,552,442	5,924,104	2029	5,331,693	13.0	3.2	0.0	1.0	17.2
700	1.489361702	1.48936	1.37531	4,371,681	1,552,442	5,924,104	2030	5,331,693	13.0	3.2	0.0	1.0	17.2
1000	2.127659574	2.12766	1.82945	6,245,230	2,065,081	8,310,311	2031	7,479,280	18.2	4.5	0.0	1.4	24.1
1400	2.978723404	2.97872	2.39455	8,743,322	2,702,956	11,446,282	2032	10,301,654	25.0	6.2	0.0	2.0	33.2
1500	3.191489362	3.19149	2.53043	9,367,845	2,856,341	12,224,187	2033	11,001,768	26.7	6.6	0.0	2.1	35.4
1500	3.191489362	3.19149	2.53043	9,367,845	2,856,341	12,224,187	2034	11,001,768	26.7	6.6	0.0	2.1	35.4
1500	3.191489362	3.19149	2.53043	9,367,845	2,856,341	12,224,187	2035	11,001,768	26.7	6.6	0.0	2.1	35.4
1500	3.191489362	3.19149	2.53043	9,367,845	2,856,341	12,224,187	2036	11,001,768	26.7	6.6	0.0	2.1	35.4
1500	3.191489362	3.19149	2.53043	9,367,845	2,856,341	12,224,187	2037	11,001,768	26.7	6.6	0.0	2.1	35.4
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1500	3.191489362	3.19149	2.53043	9,367,845	2,856,341	12,224,187	2042	11,001,768	26.7	6.6	0.0	2.1	35.4
1500	3.191489362	3.19149	2.53043	9,367,845	2,856,341	12,224,187	2043	11,001,768	26.7	6.6	0.0	2.1	35.4
1500	3.191489362	3.19149	2.53043	9,367,845	2,856,341	12,224,187	2044	11,001,768	26.7	6.6	0.0	2.1	35.4
733	1.559574488	1.55957	1.42894	4,577,754	1,610,721	6,188,475	2045	5,569,627	13.5	3.3	0.0	1.1	17.9

Check Sum	207,736,350	207,736,360
Assumptions		
1) 1735 productive hrs per year		
2) Labor rates per "Reference Year Resources		
3) TE for Labor is 1.0.	1	
4) TE for Non Labor is	0.8	
Ratio of Technicians to Total Labor	0.624251138	148
Ratio of S&E to Total Labor	0.289839444	278
Ratio of Professionals to Total Labor	0	227
Ratio of Managers to Total Labor	0.085909418	261
Total	1	

Example of Projects SQDP

		Services Scoping and Quantity Development Package (SQDP) Cover Sheet Rev 1 <i>(to be used as Estimating Scope Transmittal)</i>																																																																										
<small>Reviewed and determined to be UNCLASSIFIED</small> <small>This review does not constitute clearance for public release.</small> <small>Derivative Classifier: Robert Hanson/301750/ Reviewing Official</small> <small>Name and Position/Title</small> <small>Date: 04/16/2018</small>		1. SQDP Number 17-00196-SPD-MIE-01		2. Rev. Number 1																																																																								
3. Prep. Date 4/10/2018		4. Estimate Number 17-00196																																																																										
5. Subject Matter Expert (SME) Charles Richardson		6. SME Phone Number 667-5598		7. SME Org. SSE-2: STRATEGIC DEVELOPMENT																																																																								
8. SQDP Content Title Major Items of Equipment		9. WBS Number 23.03.02.02.02.02.15																																																																										
10. Confidence Level <small>Select High, Medium High, Medium, Medium Low, or Low from drop-down list</small>		11. Interfaces to Other WBS Elements All WBS elements under 23.03.02.02.02																																																																										
10a. Labor Confidence Level Medium		12. Management Level 1 2 <input checked="" type="checkbox"/> 3 4																																																																										
10b. Material Confidence Level Medium		Applies to: Project as a whole Specific SSC (Explain) <input checked="" type="checkbox"/>																																																																										
10c. Subs Confidence Level		13a. Quality Level (Check Box) Commercial Nuclear <input checked="" type="checkbox"/> HAZMAT Other																																																																										
10d. Equipment Confidence Level		13b. Other Q/L Safety Class Description																																																																										
10e. Estimate Class Level Class 5		14. Funding Type (Prepare separate forms for each type) Construction <input checked="" type="checkbox"/> Expense																																																																										
15. Work Package Summary Description (Attach Backup Documents for Jobhours and ODC Development) <small>This work package is for the Major Items of Equipment projects that are to be executed for the existing ARIES program independent from the SPD ramp-up. These projects are expense program funded activities. The individual MIE Projects are listed below with their associated WBS. The WBS is incorporated in the lifecycle schedule to establish the timeframe in which the work is required to be done. Work is planned in the near term as part of ongoing program activities. Pricing is based on historical data including recent active ARIES efforts, D & D of GB's for PEI 1 and other line item projects. Where possible for like activities the replacement efforts are based on the new install projects. LANL Engineering, project management, QA and other support costs are included in the new installation and D&D SQDPs and WBS elements. Costs for construction installation materials are included in the Construction SQDP and are excluded from these WBS elements.</small>																																																																												
<table border="1"> <thead> <tr> <th>Task/Description</th> <th>Deliverable Description</th> <th>Deliverable Qty</th> <th>Job Hrs</th> <th>M&S \$</th> <th>Est \$ Labor</th> <th>Totals</th> </tr> </thead> <tbody> <tr> <td colspan="7">New Equipment MIE/GPPs</td> </tr> <tr> <td>23.03.02.02.02.02.15.01 L6950</td> <td>Calorimeter #2</td> <td>1</td> <td>NA</td> <td>\$6,273,145</td> <td>\$2,073,301</td> <td>\$8,346,446</td> </tr> <tr> <td>23.03.02.02.02.02.15.02 L7030</td> <td>Stack Monitor Process Area</td> <td>1</td> <td>NA</td> <td>\$101,432</td> <td>\$3,916,728</td> <td>\$4,018,160</td> </tr> <tr> <td>23.03.02.02.02.02.15.03 L7240</td> <td>Material Intro Hood #1</td> <td>1</td> <td>NA</td> <td>\$841,685</td> <td>\$3,614,029</td> <td>\$4,455,715</td> </tr> <tr> <td>23.03.02.02.02.02.15.04 L7450</td> <td>Material Intro Hood #2</td> <td>1</td> <td>NA</td> <td>\$841,685</td> <td>\$3,614,029</td> <td>\$4,455,715</td> </tr> <tr> <td>23.03.02.02.02.02.15.05 L7660</td> <td>Refurbish 1 U and 1 PU GB with new Muffle Furnaces</td> <td>2</td> <td>NA</td> <td>\$274,000</td> <td>\$1,000,000</td> <td>\$1,274,000</td> </tr> <tr> <td>23.03.02.02.02.02.15.06 L7870</td> <td>Refurbish GB for Transfers</td> <td>1</td> <td>NA</td> <td>\$420,843</td> <td>\$1,807,015</td> <td>\$2,227,857</td> </tr> <tr> <td>23.03.02.02.02.02.15.07 L8080</td> <td>Simple Pit Cutter Installation</td> <td>1</td> <td>NA</td> <td>\$800,000</td> <td>\$3,750,000</td> <td>\$4,550,000</td> </tr> <tr> <td>23.03.02.02.02.02.15.08 L13020</td> <td>New/Emerging Projects</td> <td>1</td> <td>NA</td> <td>\$962,500</td> <td>\$1,787,500</td> <td>\$2,750,000</td> </tr> </tbody> </table>							Task/Description	Deliverable Description	Deliverable Qty	Job Hrs	M&S \$	Est \$ Labor	Totals	New Equipment MIE/GPPs							23.03.02.02.02.02.15.01 L6950	Calorimeter #2	1	NA	\$6,273,145	\$2,073,301	\$8,346,446	23.03.02.02.02.02.15.02 L7030	Stack Monitor Process Area	1	NA	\$101,432	\$3,916,728	\$4,018,160	23.03.02.02.02.02.15.03 L7240	Material Intro Hood #1	1	NA	\$841,685	\$3,614,029	\$4,455,715	23.03.02.02.02.02.15.04 L7450	Material Intro Hood #2	1	NA	\$841,685	\$3,614,029	\$4,455,715	23.03.02.02.02.02.15.05 L7660	Refurbish 1 U and 1 PU GB with new Muffle Furnaces	2	NA	\$274,000	\$1,000,000	\$1,274,000	23.03.02.02.02.02.15.06 L7870	Refurbish GB for Transfers	1	NA	\$420,843	\$1,807,015	\$2,227,857	23.03.02.02.02.02.15.07 L8080	Simple Pit Cutter Installation	1	NA	\$800,000	\$3,750,000	\$4,550,000	23.03.02.02.02.02.15.08 L13020	New/Emerging Projects	1	NA	\$962,500	\$1,787,500	\$2,750,000
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23.03.02.02.02.02.15.04 L7450	Material Intro Hood #2	1	NA	\$841,685	\$3,614,029	\$4,455,715																																																																						
23.03.02.02.02.02.15.05 L7660	Refurbish 1 U and 1 PU GB with new Muffle Furnaces	2	NA	\$274,000	\$1,000,000	\$1,274,000																																																																						
23.03.02.02.02.02.15.06 L7870	Refurbish GB for Transfers	1	NA	\$420,843	\$1,807,015	\$2,227,857																																																																						
23.03.02.02.02.02.15.07 L8080	Simple Pit Cutter Installation	1	NA	\$800,000	\$3,750,000	\$4,550,000																																																																						
23.03.02.02.02.02.15.08 L13020	New/Emerging Projects	1	NA	\$962,500	\$1,787,500	\$2,750,000																																																																						
16. Basis and Assumptions: Basis: <ul style="list-style-type: none"> The New Equipment MIE/GPPs are primarily new installations required to support programmatic operations and maintain capabilities. Refurbish activities are estimated as new installations to allow work to progress in operating systems while the replacement systems are installed and started up. The cost base for the SQDP GB MIE/GPP projects is developed, where possible, from the like activities in the "Project" WBS. Details, basis and assumptions are not repeated for these activities and the costs are built up from level "Project" WBS detail. The Total construction Labor costs must include: the craft Labor, field non-Manual for supervisors, planners, field engineers, Construction management, Operations support to RCTs, ES&H, Crit Laundry, FOD, Security, and etc. Assumptions: <ul style="list-style-type: none"> Facility and facility services/utilities available today will be available at the time of the capital project installations. There will be minimal interface with existing ML-2 systems. 																																																																												
17. Attached Documents List:																																																																												
18. Unresolved Issues/Risks: None																																																																												
19. Management Reserve Estimate Uncertainty Confidence Basis: <small>Although SME experience and historical data were utilized to develop the estimate, PF-4 is a Security Category 1, Hazard Category 2 Nuclear Facility and, as a result, Management Reserve and Schedule Estimate Uncertainty is medium overall due to the potential of how unknown issues will affect D & D efforts. Furthermore, unknown pre-existing facility conditions are often encountered when disconnecting facility systems, such as electrical, that may cause additional efforts than planned. These situations are often only discovered once the system has been Locked Out/Tagged Out and the facility systems breached.</small>																																																																												
Concurrence/Approvals (once Scoping review have been completed)																																																																												
<table> <tr> <td>SME:</td> <td>Charles Richardson</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Cost Scheduler</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Div/Project Manager</td> <td>Brett Cederdahl</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Estimator</td> <td>Jeff Kelley</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Printed Name</td> <td></td> <td>Signature</td> <td></td> <td>Date</td> <td></td> </tr> </table>							SME:	Charles Richardson						Cost Scheduler							Div/Project Manager	Brett Cederdahl						Estimator	Jeff Kelley							Printed Name		Signature		Date																																				
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Schedule Summary

WBS No.	WBS Name	Start Date	End Date
23.03.02.02.02.01	Program Management	03-Oct-16	8-Aug-45
23.03.02.02.02.02	Operations	03-Oct-16	8-Aug-45
23.03.02.02.02.03	Deactivation (End of Operations)	03-Oct-39	02-July-49
23.03.02.02.02.04	Projects	1-Oct-18	7-May-31
23.03.02.02.02.04.01	Process Equipment Installation	1-Oct-18	7-May-31
23.03.02.02.02.04.02	Process Support	1-Oct-18	12-Jan-28